Client's ref.: TSMC2001-1472
Our ref.: 0503-8768-USf/Yianhou/Kevin/Nelson

DISPATCH METHOD AND SYSTEM

BACKGROUND

The present invention relates to manufacturing management, and particularly to a dispatch method and system for

5   Long-duration Processing Batch Equipment (LPBE) that reserves lots at preceding steps in the manufacturing process.

In semiconductor manufacturing, LPBE, such as furnace equipment utilizes long process time and batch process. As it requires several hours to rework defective lots, processing

10   quality and manufacture scheduling are important.

The manufacturing department controls process quality by defining processing time constraints for each lot passing through LPBE. The time between tracking out from the preceding step's equipment and tracking in to the subsequent step's

15   equipment for each lot should conform to the processing time constraint. Before entering LPBE, lots must enter the preceding step's equipment for removal of residual particles in advance. In practice, each preceding step's equipment provides lots for different LPBE. Since there is no mechanism between the

1

preceding step's equipment and LPBE to manage lot dispatch and

stream, the quantity of dispatched lots for each LPBE may differ.

Therefore, the utilization rate of LPBE having fewer lots may

be decreased, and those having more lots may be delayed,

5   undermining the processing time constraint, such that the lots

needs to be reworked, thereby wasting processing resources.

SUMMARY

The present invention is proposed to address and solve the

aforementioned issues. It is noted that the present invention

10   is applicable to any factory, service supplier, equipment and

product.

Accordingly, it is an object of the present invention to

provide a dispatch method and system for LPBE that reserves lots

at preceding steps in the manufacturing process.

15   To achieve the above object, the present invention provides

a dispatch method and system. The dispatch system includes LPBE,

a plurality of equipment tools preceding the LPBE, and a dispatch

unit. First, the LPBE retrieves equipment candidates having

capabilities compatible with those of the LPBE among the

2

preceding step's equipment in the dispatch unit, and selects at

least one. Then, lots corresponding to the selected candidate

are retrieved, grouped and sorted to obtain a plurality of

batches, with at least one designated as a reserve batch.

5   Thereafter, the selected candidate performs processes

corresponding to the compatible capability on the reserve batch,

and forwards the processed batch to the LPBE.

The lots are first grouped according to the capabilities

of the LPBE, such that a plurality of lot groups is obtained.

10   Then, the lots of each lot group and the lot groups are sorted

according to a priority rule, such that the batches are

generated. Additionally, each lot group is further split if the

number of lots in the lot group exceeds the maximum loading that

can be handled by the LPBE.

15   The priority rule is used to determine whether designated

hot lots exist in any of the lot groups, and determine stage

target, priority, and queue time for the lots in each lot group,

and the quantity of wafers in each lot group.

The above-mentioned method may take the form of program

20   code embodied in tangible media. When the program code is loaded

3

into and executed by a machine, the machine becomes an apparatus

for practicing the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The aforementioned objects, features and advantages of

5 this invention will become apparent by referring to the

following detailed description of the preferred embodiment with

reference to the accompanying drawings, wherein:

Fig. 1 is a schematic diagram illustrating the architecture

of the dispatch system according to the present invention;

10   Fig. 2 is a flowchart showing the process of the dispatch

method according to the present invention; and

Fig. 3 is a flowchart showing a process of grouping and

sorting according to the present invention.

DESCRIPTION

15   Fig. 1 illustrates the architecture of the dispatch system

according to the present invention.

In semiconductor manufacturing, lots must enter equipment

preceding the LPBE for removal of residual particles before

entering the LPBE. In the embodiment, the LPBE is furnace

4

equipment, and the preceding step's equipment is cleaning

equipment, but the invention is not limited thereto.

The dispatch system includes furnace equipment 110 (LPBE),

a plurality of cleaning equipment tools 100, 101 and 102

5   (preceding step's equipment) preceding the furnace equipment

110, and a dispatch unit 120. After cleaning, tools 100, 101

and 102 forwards lots to the furnace equipment 110 for further

processing. The furnace equipment 110 utilizes long process

time and batch process, in which several lots are processed

10   simultaneously.

The dispatch unit 120 controls the process flow of each lot,

and provides information regarding thereto. The dispatch unit

120 includes a dispatch engine executing dispatch logic and

generating a list of dispatched lots for each equipment tool.

15   The dispatch unit 120 provides reservation capability whereby

the lots may be reserved for processing by designated equipment.

In advanced processing, equipment may have several

capabilities to execute particular processes. To improve the

utilization rate of the equipment, the capacity (*CapaCapacity*)

5

Client's ref.: TSMC2001-1472
Our ref.: 0503-8768-USf/Yianhou/Kevin/Nelson

of each capability and the required capacity (*reqCapaCapacity*)

of the capability are defined as follows.

$$CapaCapacity = \frac{\sum (eqp.capa.peakThroughput \times eqp.capa.planAvailable)}{6 \times 24}, \text{ and}$$
$$eqp.capa.available$$

$$reqCapaCapacity = \sum_{lot.recp.capability=capabilityId} 1 + \sum_{lot.next\,Re\,cp.capability=capabilityId} 1,$$

5   where *CapaCapacity* represents the total capacity

corresponding to a specific capability of all equipment, the

unit of the capacity being batch (one batch has 6 lots, and each

lot has 24 wafers), *eqp.capa.peakThroughput* represents the

maximum capacity of the equipment in one hour,

10   *eqp.capa.planAvailable* represents a time ratio of the equipment

performing process of the capability, and *reqCapaCapacity*

represents the quantity of lots subject to process the

capability in both current and preceding steps (equipment).

Consequently, if the *CapaCapacity* × 6 exceeds the

15   *reqCapaCapacity* , it means capacity exceeds requirement

6

Client's ref.: TSMC2001-1472
Our ref.: 0503-8768-USf/Yianhou/Kevin/Nelson

(demand). Otherwise, requirement exceeds capacity. To achieve

capacity/demand balance and best utilization rate of equipment,

the *CapaCapacity* × 6 and the *reqCapaCapacity* should be

maintained equally, using the grouping, sorting, and

5   reservation mechanisms of the invention.

Fig. 2 shows the process of the dispatch method according

to the present invention.

First, in step S201, furnace equipment 110 (LPBE) retrieves

equipment candidates having capabilities compatible with those

10 of the furnace equipment 110 from among the cleaning equipment

100, 101 and 102 (preceding step's equipment) in the dispatch

unit 120. It is noted that the capabilities of the cleaning

equipment 100, 101 and 102 and furnace equipment 110 can be

stored in the dispatch unit 120 in advance, or the dispatch unit

15 120 can receive candidate listing from a Manufacturing Execution

System (MES).

In step S202, at least one of the candidates is selected,

and in step S203, lots corresponding to the selected candidate

are retrieved from the dispatch unit 120. Then, in step S204,

20 the lots are grouped and sorted to obtain a plurality of batches.

Fig. 3 shows a process of grouping and sorting according

to the present invention.

First, in step S301, the lots are grouped according to the

capabilities of the furnace equipment 110, such that a plurality

5   of lot groups is obtained. In step S302, the lots of each group

are then sorted according to a priority rule. If the number of

the lots in any lot group exceeds the maximum loading of the

furnace equipment 110, in step S303, the lot group is split until

the number of the lots in each lot group is smaller than the

10   maximum. Then, in step S304, the lot groups are further sorted

according to the priority rule, such that batches are generated,

and each batch has a priority.

The priority rule is used to determine whether designated

super hot lots and hot lots exist in any of the lot groups, and

15   determines stage target, queue time and priority of the lots in

each lot group, and the quantity of wafers in each lot group.

The priority rule respectively defines a weight for each

determination item, such that each lot group has a respective

total weight for sorting.

8

Referring to Fig. 2 again, in step S205, at least one of the batches is designated as a reserve batch according to corresponding capability and priority. Thereafter, in step S206, the selected candidate (cleaning equipment) executes a

5 process, corresponding to the capability, on the reserve batch, and then forwards the processed batch to the furnace equipment 110. It is noted that the dispatch unit 120 can provide information of dispatched lots to both the selected candidate and the furnace equipment 110. Then, in step S207, the furnace

10 equipment 110 then performs furnace process on the batch forwarded from the selected candidate.

The present invention thus provides a dispatch method and system for Long-duration Processing Batch Equipment (LPBE) that reserves lots at preceding steps in manufacturing process,

15 thereby increasing utilization rate and ensuring the process quality of LPBE.

The method and system of the present invention, or certain aspects or portions thereof, may take the form of program code (i.e., executable instructions) embodied in tangible media,

20 such as floppy diskettes, CD-ROMS, hard drives, or any other

9

Client's ref.: TSMC2001-1472
Our ref.: 0503-8768-USf/Yianhou/Kevin/Nelson

machine-readable storage medium, wherein, when the program code

is loaded into and executed by a machine, such as a computer,

the machine becomes an apparatus for practicing the invention.

The method and systems of the present invention may also be

5   embodied in the form of program code transmitted over some

transmission medium, such as electrical wiring or cabling,

through fiber optics, or via any other form of transmission,

wherein, when the program code is received and loaded into and

executed by a machine, such as a computer, the machine becomes

10   an apparatus for practicing the invention. When implemented on

a general-purpose processor, the program code combines with the

processor to provide a unique apparatus that operates

analogously to application specific logic circuits.

Although the present invention has been described in its

15   preferred embodiments, it is not intended to limit the invention

to the precise embodiments disclosed herein. Those skilled in

this technology can still make various alterations and

modifications without departing from the scope and spirit of

this invention. Therefore, the scope of the present invention

Client's ref.: TSMC2001-1472

Our ref.: 0503-8768-USf/Yianhou/Kevin/Nelson

shall be defined and protected by the following claims and their

equivalents.